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July 6, 2005

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IDEM-OLC

Matthew Gernand, Esq.
IDEM Office of Legal Counsel
P.O. Box 6015
Indianapolis, Indiana 46206-6015

RE: Alcoa Inc. – Warrick Operations Comments on IDEM’s “Site-Specific
Water Quality Criteria (WQC) for Aluminum: 2005 – An Update”

Dear Matt:

On April 6, 2005, you sent via e-mail a document titled “Site-Specific Water Quality Criteria (WQC) for Aluminum: 2005 – An Update.” This document was prepared by Dr. Syed GhiasUddin, Chief of the Environmental Toxicology/Chemistry Section of IDEM’s Office of Water Quality. Alcoa Inc. – Warrick Operations (“ALCOA”) has reviewed this document, and offers the following comments. These comments are provided to assure technical clarity in the process for developing Indiana warm water site-specific criteria for aluminum.

Comment # 1 (Page 2)

IDEM lowered the chronic criterion to 174 µg/L to protect surrogates of Striped Bass and Largemouth Bass based on studies using Striped Bass as the test specie (Buckler et al. manuscript). Although the Striped Bass study was used by USEPA to determine the 1988 aluminum national chronic criterion, it is not a valid study, according to the USEPA document “Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses” (“USEPA Guidelines”), and should not be used for criteria calculations. The test duration of seven (7) days is not appropriate for use in chronic criterion calculation. Chronic fish test durations should be no less than 24 days after hatching of next generation for partial and full life-cycle tests or 28-32 days for early life-stage tests. IDEM should explain that the study is not compliant with the USEPA Guidelines.

IDEM lists studies performed with Largemouth Bass, Narrowmouth Toad and Goldfish as confirmation for their decision to lower the chronic criterion to 174 µg/L, but USEPA had listed these studies, as well as the Striped Bass study, in Table 6 of the USEPA “Ambient Water Quality Criteria for Aluminum – 1988”. Table 6 lists studies that did not meet USEPA 1985 Guidelines for data acceptability and validity requirements and were not used in deriving the national aluminum criteria. IDEM should acknowledge that the data are not acceptable and were not used by USEPA.

Comment # 2 (Page 3)

There is a typographical error under section "Site-Specific WQC Calculated by ALCOA in 2004". The "FAV = 1982.4" should read "FAV = 1882.4".

Comment # 3 (Page 3)

IDEM states "Additionally, ALCOA for some unexplained reasons did not use the A-C Ratio of 51.47 from *Daphnia magna* reported in the 1988 Aluminum Criteria document." ALCOA did not use the ACR of 51.47 for *D. magna* because it is more than a factor of 10 higher than the ALCOA calculated ACR of 4.79 (see below).

The ACR of 10.64, as calculated in the USEPA 1988 Aluminum criteria document, was calculated incorrectly. ALCOA's consultant, ADVENT/ENVIRON, obtained and reviewed the original Kimball (1978) reference. The following discrepancies associated with the chronic Fathead Minnow tests were noted:

- Only one set of chronic limits was presented in the USEPA 1988 Aluminum criteria document Table 2, but both survival and growth limits should be considered.
- The limits presented (NOEC = 2,300 µg/L, LOEC = 4,700 µg/L) are incorrect according to original reference. Chronic limits used for chronic value calculations should be (as per Kimball 1978):

FHM Survival:

NOEC = 7,100 µg/L, LOEC = 11,900 µg/L

MATC = 9,200 µg/L

FMH Growth:

NOEC = 4,700 µg/L, LOEC = 7,100 µg/L

MATC = 5,780 µg/L (rounded to 5,800 mg/L by IDEM)

FHM LC50 = 35,000 µg/L

Survival ACR = $35,000 / 9,200 = 3.804$

Growth ACR = $35,000 / 5800 = 6.034$

Therefore; ACR for FHM = 4.79

Comment # 4 (Page 4 Part i.)

Although IDEM (and USEPA) are accepting the addition of the *Crangonyx* (Martin and Holdich 1986 study) data and the correction of the *Dugesia* study result (from 23,000 µg/L to 16,600 µg/L); they are not accepting the addition of *Tubifex* and *D. magna* (Khangarot) data. IDEM states that these two studies are unacceptable "because the Aluminum salt used for testing contained ammonia". These studies were included in ALCOA's database because David Kallander of IDEM's Office of Water Quality had used them for the Aluminum draft Tier II value calculation. These studies were also found acceptable in the "Great Lakes Water Quality Guidance for Chemicals of Initial Focus Database Evaluation", prepared for USEPA Office of Water by Michigan DEQ (Jan 1996). ALCOA acknowledges that IDEM and EPA are correct in being concerned about ammonium sulfate causing toxicity and possibly skewing toxicity test results, particularly if pH is greater than 8 in the toxicity test. However, *D. magna* and *Tubifex* are typically not as sensitive to ammonium as warm water fish, and it is doubtful that the unionized ammonia would contribute to the response of these organisms. The statement should be "...Aluminum salt used for testing contained **ammonium sulfate** and data from such studies should not be used in criteria calculations **if the species is more sensitive to the anion than it is to the cation.**"

Comment # 5 (Page 4 Part ii.)

The Dissolved Oxygen value of 49.3%, given by IDEM, for the test water was not actually stated in the original paper. Only DO values in mg/L of the dilution water (tubewell water) were given in the paper. Concentration (mg/L), temperature, and altitude measurements are needed in order to calculate the percent DO. If personal communications with the study author occurred in order to determine the percent DO, these personal communications should be referenced. Otherwise, it is not appropriate to make assumptions in regards to test conditions. In addition, actual DO measurements taken during the tests were not presented in the paper. It is not appropriate to speculate what DO conditions might have been during the test. DO concentration was measured (5.2-6.5 mg/L), but other information (altitude) was not given in order to calculate percent DO.

Comment # 6 (Page 4 Part iv.)

IDEM again states that ALCOA should use the ACR of 51.47 for *D. magna* in the chronic criterion calculation. Comment # 3 explains that the use of this ACR is not appropriate.

IDEM also states that an acceptable ACR must come from a **sensitive specie** such as *Ceriodaphnia sp.* and not from Fathead minnow data. It is stated in 327 IAC 2-1-8.3 "The CAC can be calculated by dividing the FAV by an acute-to-chronic ratio (or geomean of the acute-chronic ratios if more than one is available) for at least one North American freshwater species." It does not state that the ACR **must come from a sensitive specie**. Therefore, use of Fathead minnow data to generate an ACR is acceptable. IDEM can exercise its best professional judgment as to what species to use in the geomean calculation of an ACR, but should frame the decision in that manner with reference to precedence or USEPA guidance.

Comment # 7 (Page 5)

IDEM described the possible addition of data from a study with an isopod, *Asellus*. It would not have been acceptable to use these data due to the inappropriate test duration (72 hrs). EPA 1985 Guidance prefers the use of 48-hr or 96-hr LC50s, not 72-hr. Therefore, the discussion of what possible FAVs would result after the addition of *Asellus* is irrelevant and should be replaced with the statement that the data are not acceptable for criteria derivation.

Comment # 8 (Page 6)

The discussion of using an ACR of 23.4, based on the geomean of 10.64 and 51.47, should be re-drafted as the ACR of 10.64 was incorrectly calculated. Therefore, the possible chronic criterion of 84.87 µg/L is incorrect.

Comment # 9 (Page 9 Table 3)

The GMAVs listed for *Perca* and *Ictalurus* were truncated. The correct values should be >49,800 for *Perca* and >47,900 for *Ictalurus*. Statistics (cumulative probability, square root, $\ln(\text{GMAV})$ and $\ln(\text{GMAV})^2$) as presented in Table 3 need to have the number of decimals displayed so data handling can be clearly understood.

For example:

C. dubia Sq. Rt. (P) = 0.27735

versus the IDEM value of 0.2273, which is the truncated result or
0.2774, which is the rounded (to four decimals) result

This change would result in the Sum of Sq. Rt. (P) = 1.7047

versus the IDEM value of 1.7046

Dugesia $\ln(\text{GMAV}) = 9.71716$

versus the IDEM value of 9.7172

This change would result in the $\ln(\text{GMAV})^2 = 94.42316$

versus the IDEM value of 94.4240

C. dubia $\ln(\text{GMAV}) = 7.88156$

versus the IDEM value of 7.8816

This change would result in the $\ln(\text{GMAV})^2 = 62.11899$

versus the IDEM value of 62.1196

The changes to $\ln(\text{GMAV})$ and $\ln(\text{GMAV})^2$ result in the Sums being

$$\ln(\text{GMAV}) = 36.72339 \text{ and } \ln(\text{GMAV})^2 = 339.79963$$

versus the IDEM values of 36.7235 and 339.8017

Correcting these values, which impact the "S," "L", and "A" inputs into the statistical equations, results in a FAV of 1,972 $\mu\text{g/L}$ and AAC of 986 $\mu\text{g/L}$ versus the IDEM values of 1,974 $\mu\text{g/L}$ and 987 $\mu\text{g/L}$, respectively.

Conclusion

ALCOA appreciates the opportunity to provide these comments, and requests IDEM make revisions to "Site-Specific Water Quality Criteria (WQC) for Aluminum: 2005 – An Update" consistent with these comments. If you have any questions or would like to discuss these issues further, please let me know.

Sincerely,



Kari Evans

cc: Dennis Wene, Alcoa Inc. – Warrick Operations
Richard Dworek, Esq., Alcoa Inc.
Fredric Andes, Esq., Barnes & Thornburg LLP
Robin Garibay, ADVENT-ENVIRON